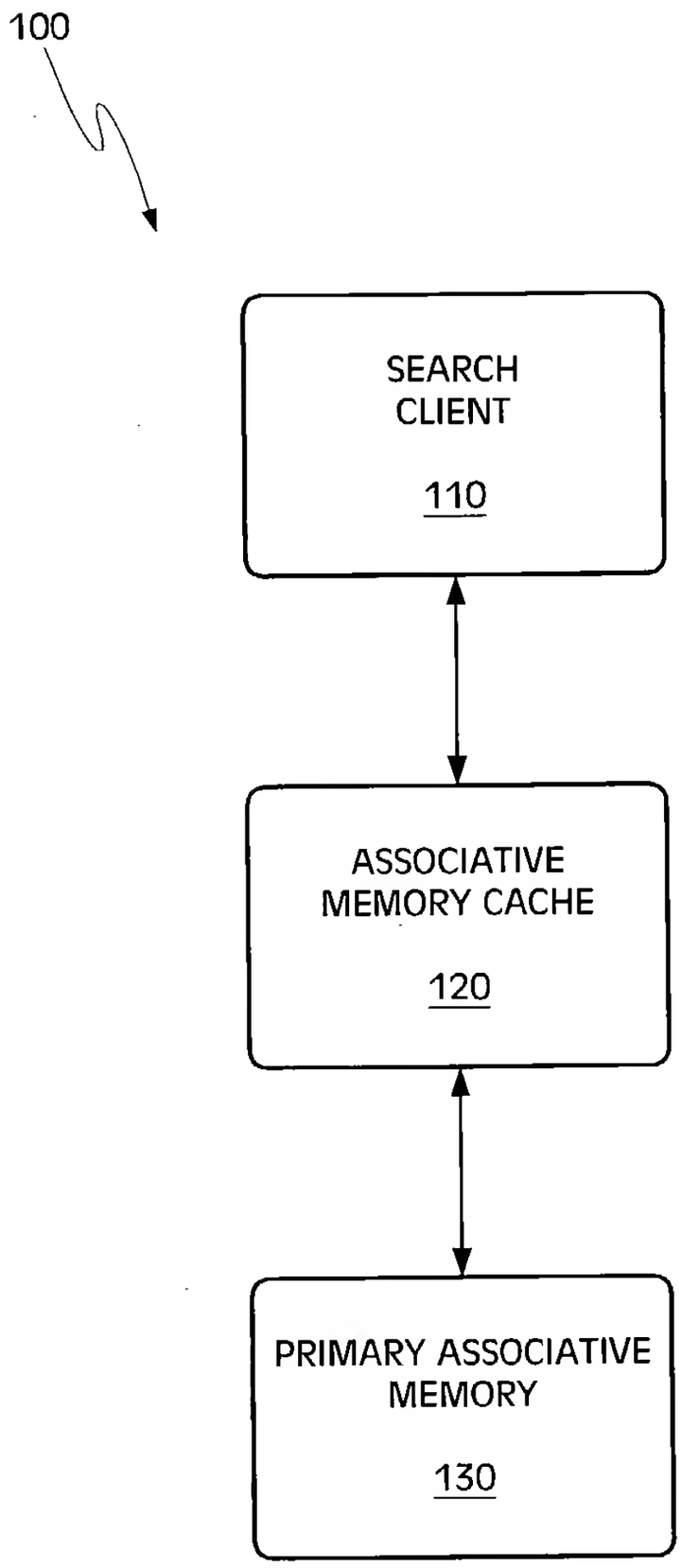

FIG. 1
(PRIOR ART)

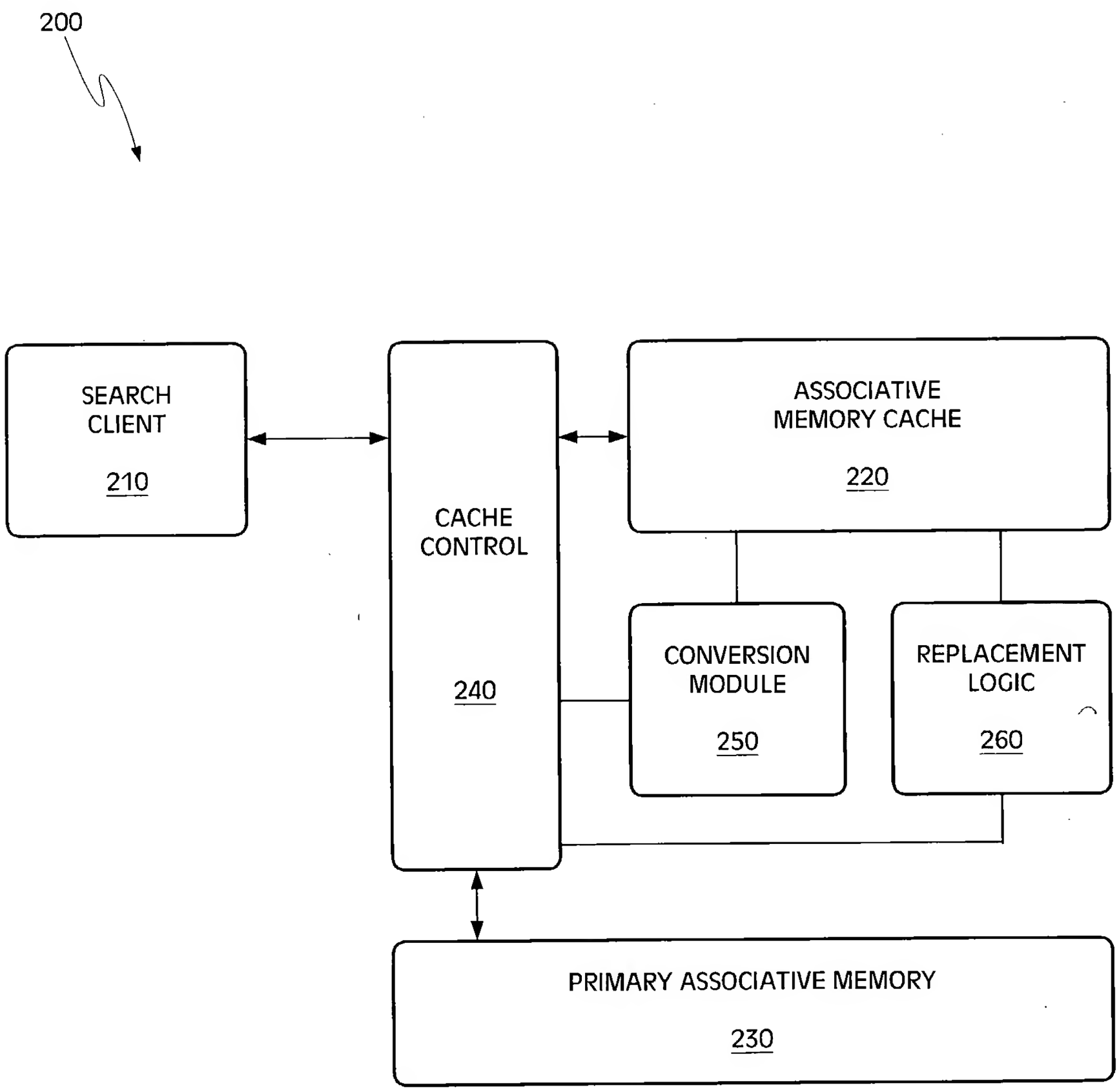
200
SEARCH CLIENT
210
CACHE CONTROL
240
ASSOCIATIVE MEMORY CACHE
220
CONVERSION MODULE
250
REPLACEMENT LOGIC
260
PRIMARY ASSOCIATIVE MEMORY
230

FIG. 2A

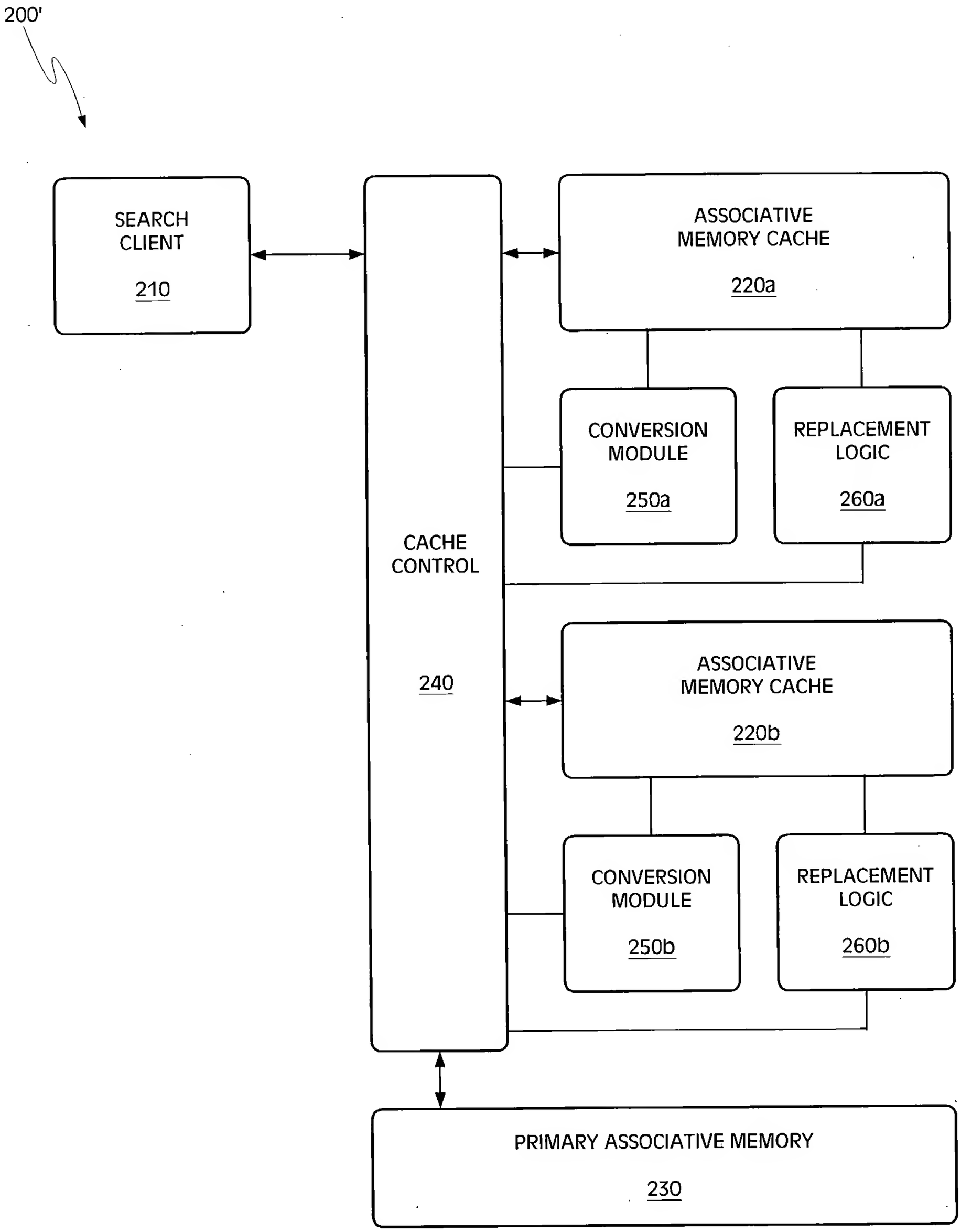
200'
SEARCH CLIENT
210
CACHE CONTROL
240
ASSOCIATIVE MEMORY CACHE
220a
CONVERSION MODULE
250a
REPLACEMENT LOGIC
260a
ASSOCIATIVE MEMORY CACHE
220b
CONVERSION MODULE
250b
REPLACEMENT LOGIC
260b
PRIMARY ASSOCIATIVE MEMORY
230

FIG. 2B

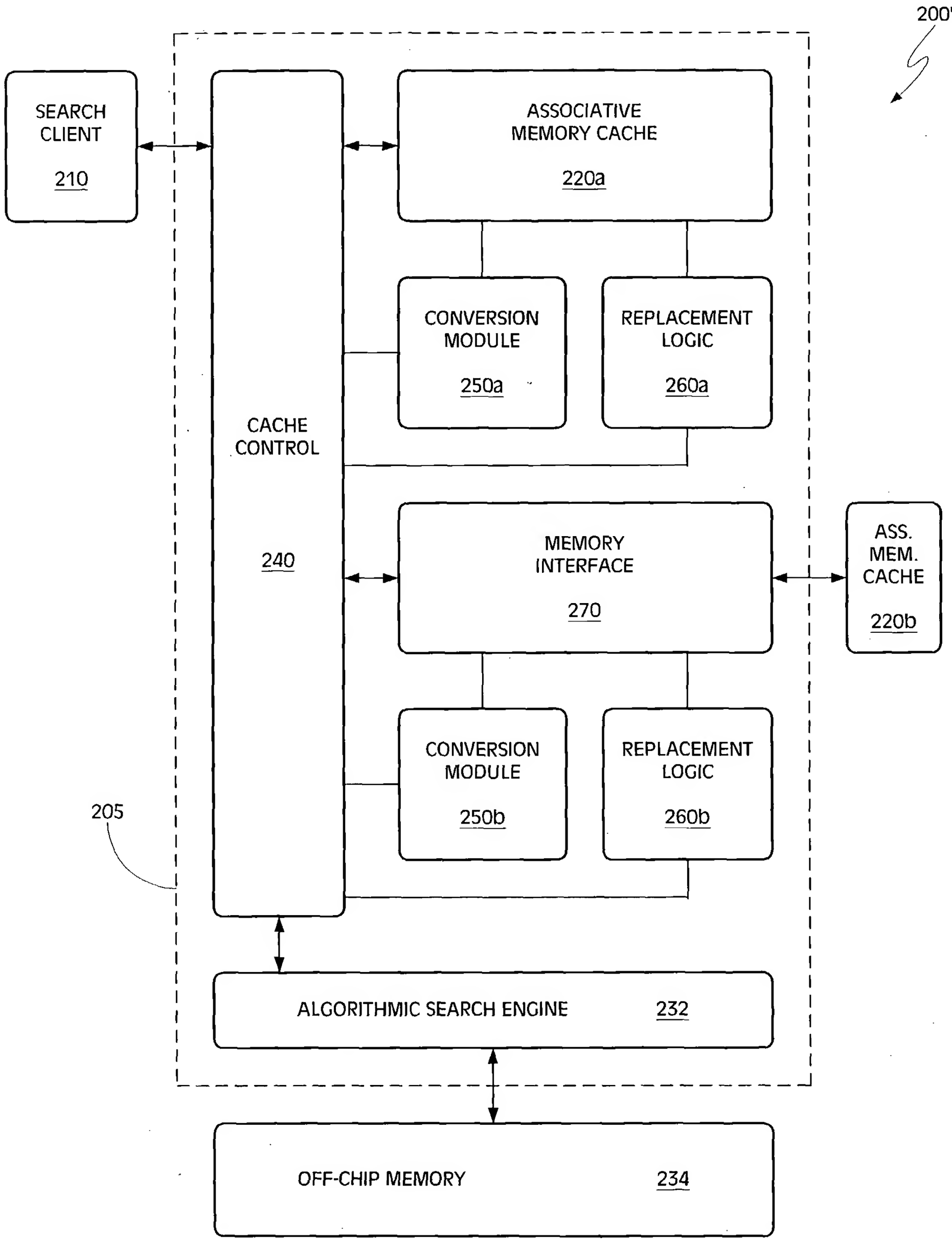
200"
SEARCH CLIENT
210
ASSOCIATIVE MEMORY CACHE
220a
CONVERSION MODULE
250a
REPLACEMENT LOGIC
260a
CACHE CONTROL
240
MEMORY INTERFACE
270
ASS. MEM. CACHE
220b
CONVERSION MODULE
250b
REPLACEMENT LOGIC
260b
205
ALGORITHMIC SEARCH ENGINE 232
OFF-CHIP MEMORY 234

FIG. 2C

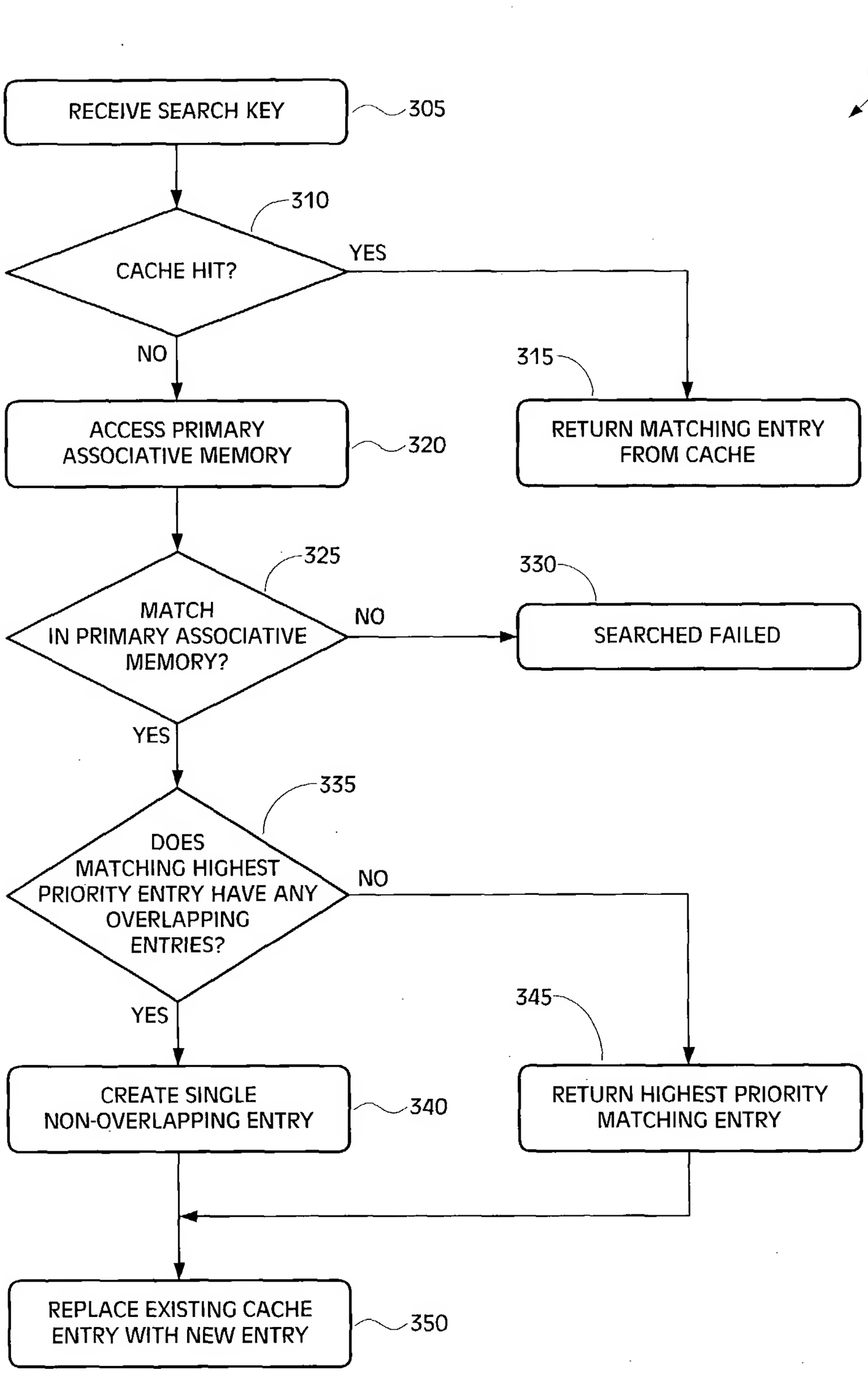
300
RECEIVE SEARCH KEY
305
310
CACHE HIT?
YES
NO
315
RETURN MATCHING ENTRY FROM CACHE
ACCESS PRIMARY ASSOCIATIVE MEMORY
320
325
MATCH IN PRIMARY ASSOCIATIVE MEMORY?
NO
330
SEARCHED FAILED
YES
335
DOES MATCHING HIGHEST PRIORITY ENTRY HAVE ANY OVERLAPPING ENTRIES?
NO
YES
345
CREATE SINGLE NON-OVERLAPPING ENTRY
340
RETURN HIGHEST PRIORITY MATCHING ENTRY
REPLACE EXISTING CACHE ENTRY WITH NEW ENTRY
350

FIG. 3

400

418 412 416 414

ENTRY	RANGE	COMPARAND	PRIORITY	ASS. DATA	
A	128.192.128.144 → 128.192.128.145	1001000X	4	DATA A	410a
B	128.192.128.144 → 128.192.128.159	1001XXXX	1	DATA B	410b
C	128.192.128.152 → 128.192.128.155	100110XX	3	DATA C	410c
D	128.192.128.152 → 128.192.128.159	10011XXX	2	DATA D	410d

FIG. 4A

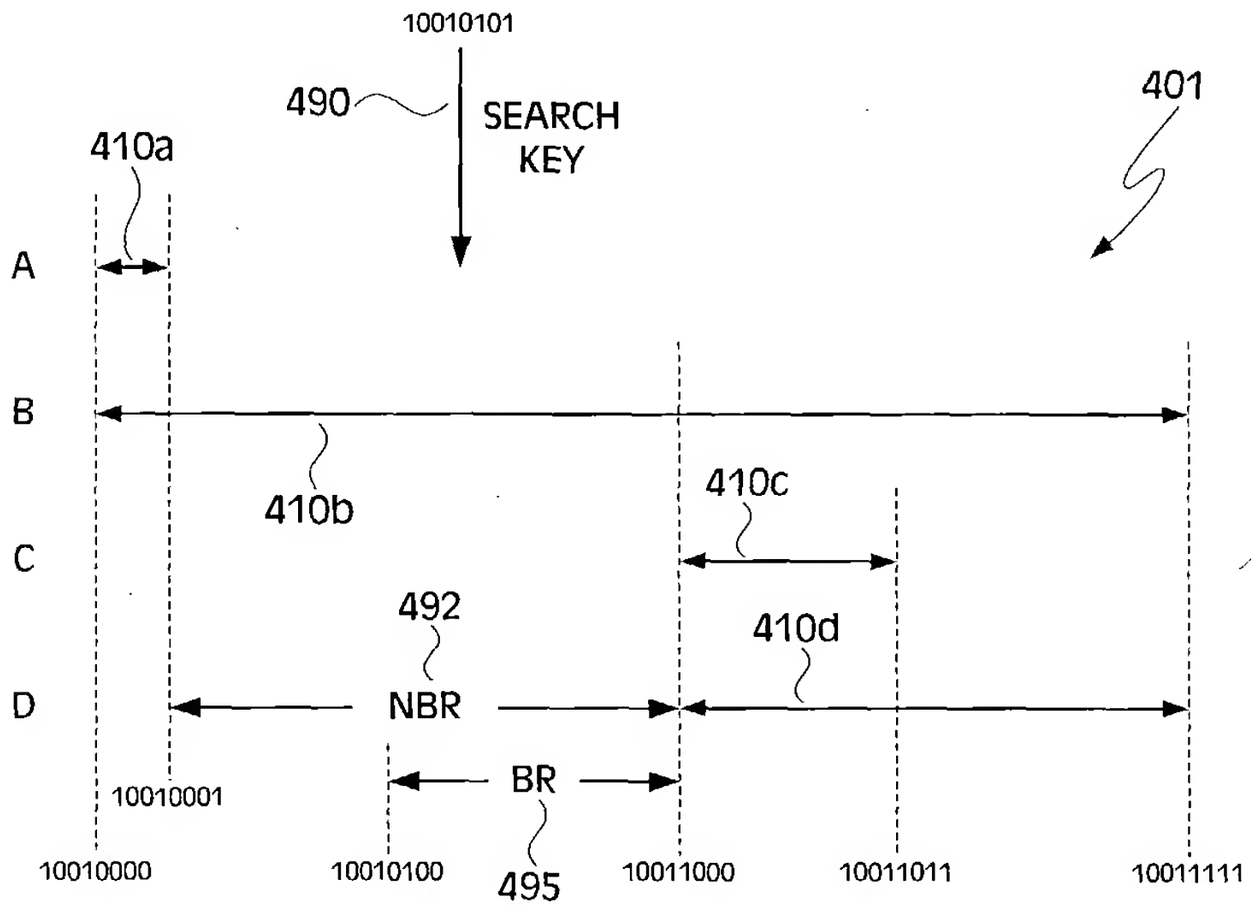

FIG. 4B

500

513a 513b

518 512 516 514

ENTRY	RANGE	COMPARAND		PRIORITY	ASS. DATA	
		LB	UB			
Q	255.192.128.3 → 255.192.128.39	3	39	1	DATA X	~510q
R	255.192.128.12 → 255.192.128.18	12	18	2	DATA Y	~510r
S	255.192.128.14 → 255.192.128.20	14	20	3	DATA Z	~510s

FIG. 5A

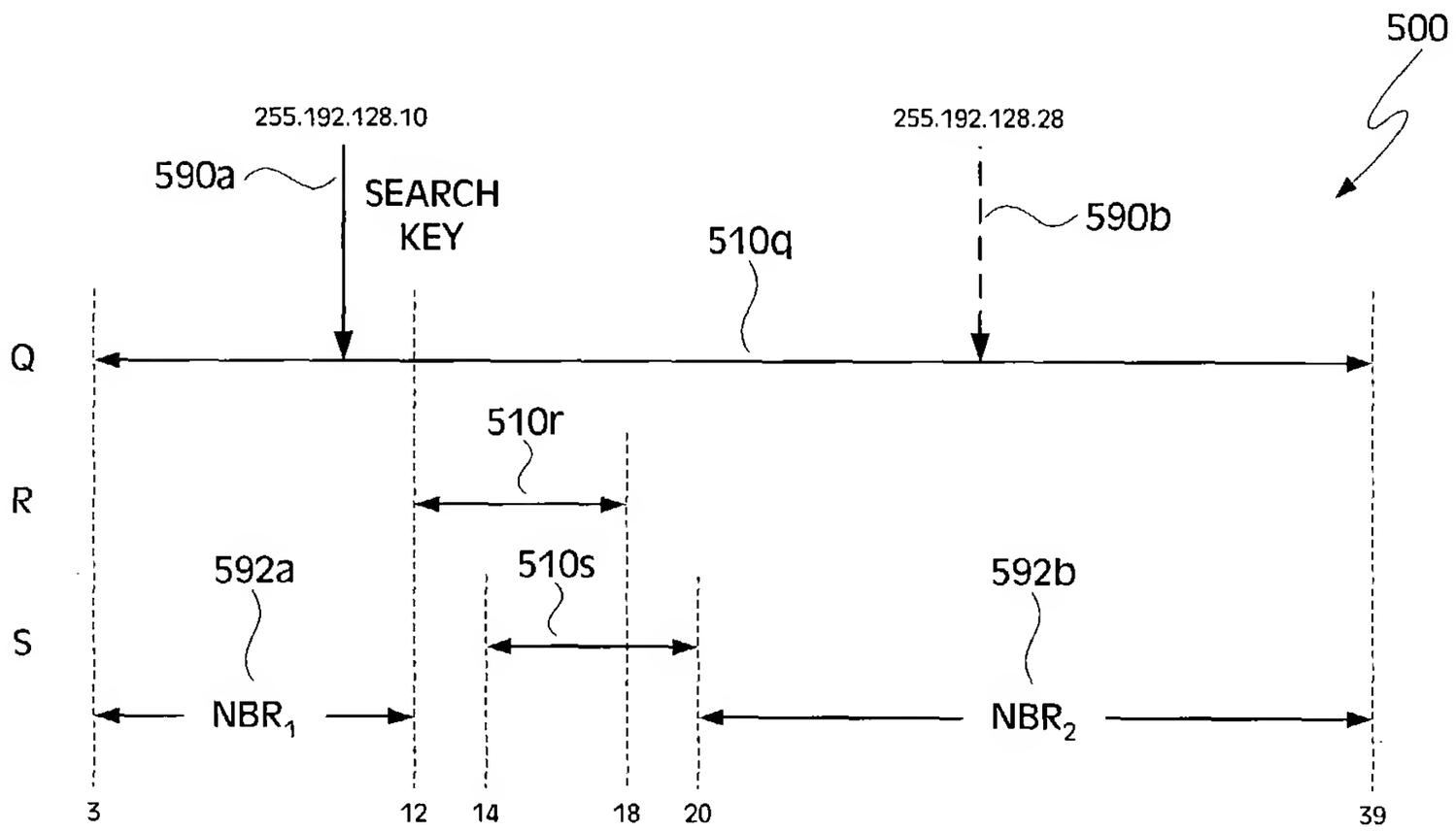

FIG. 5B

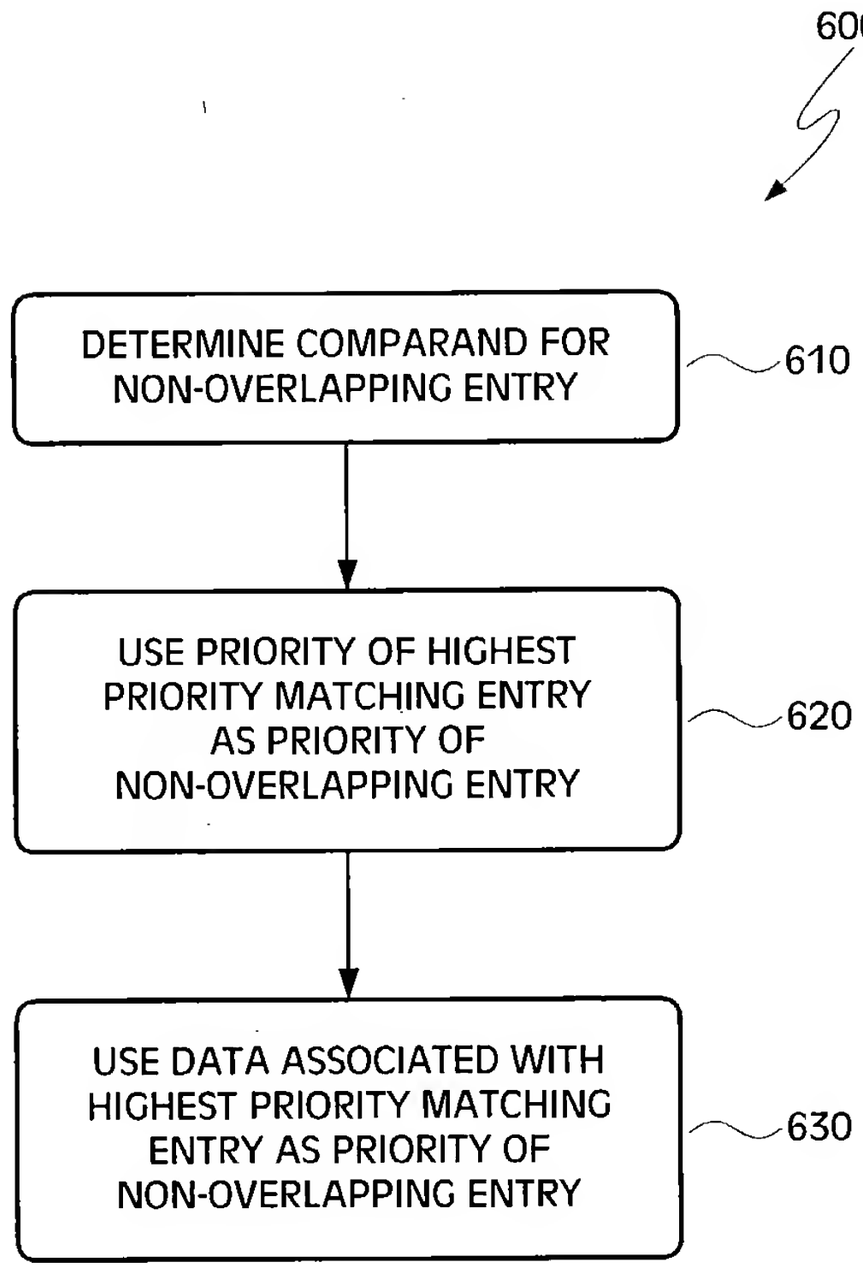
600
DETERMINE COMPARAND FOR NON-OVERLAPPING ENTRY
610
USE PRIORITY OF HIGHEST PRIORITY MATCHING ENTRY AS PRIORITY OF NON-OVERLAPPING ENTRY
620
USE DATA ASSOCIATED WITH HIGHEST PRIORITY MATCHING ENTRY AS PRIORITY OF NON-OVERLAPPING ENTRY
630

FIG. 6

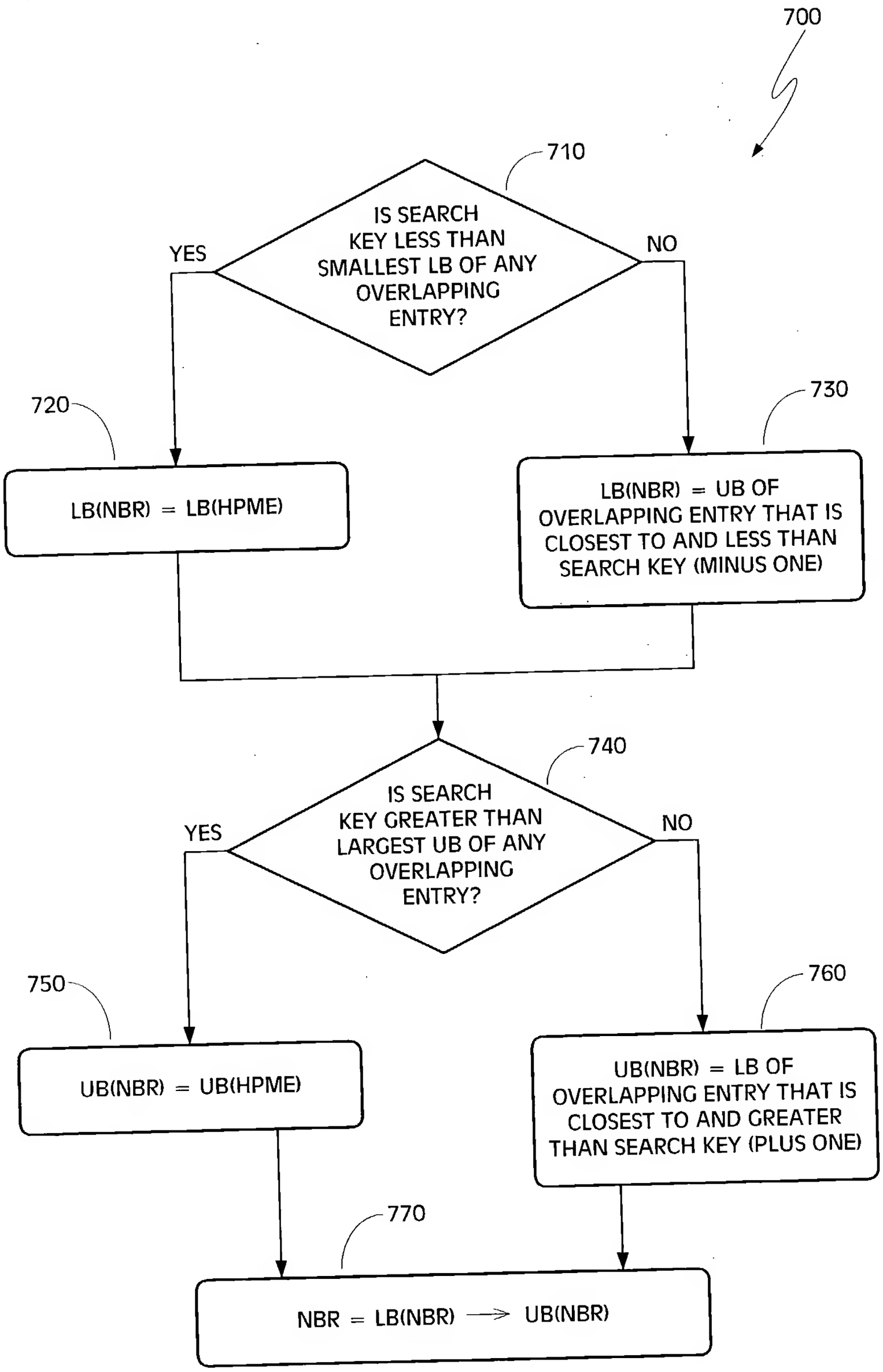
700
710
IS SEARCH KEY LESS THAN SMALLEST LB OF ANY OVERLAPPING ENTRY?
YES
NO
720
LB(NBR) = LB(HPME)
730
LB(NBR) = UB OF OVERLAPPING ENTRY THAT IS CLOSEST TO AND LESS THAN SEARCH KEY (MINUS ONE)
740
IS SEARCH KEY GREATER THAN LARGEST UB OF ANY OVERLAPPING ENTRY?
YES
NO
750
UB(NBR) = UB(HPME)
760
UB(NBR) = LB OF OVERLAPPING ENTRY THAT IS CLOSEST TO AND GREATER THAN SEARCH KEY (PLUS ONE)
770
NBR = LB(NBR) → UB(NBR)

FIG. 7

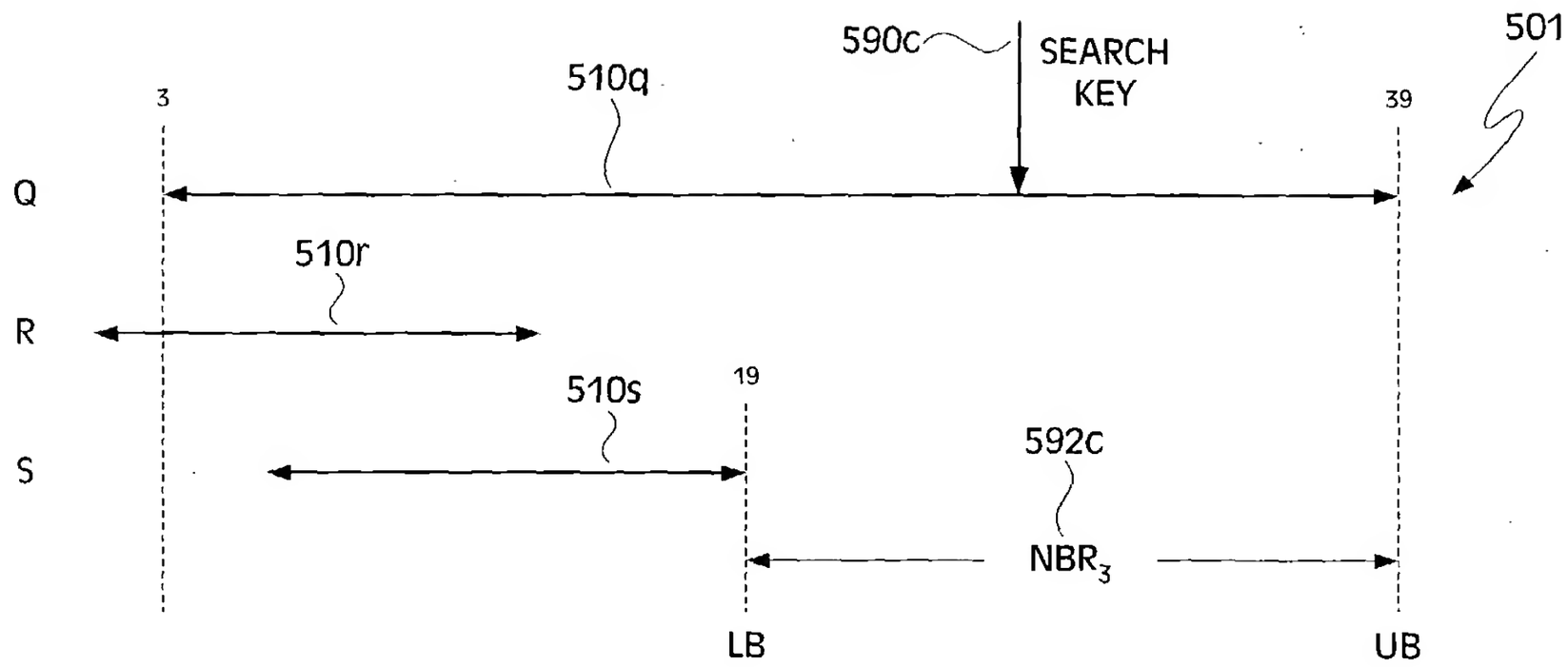

FIG. 8A

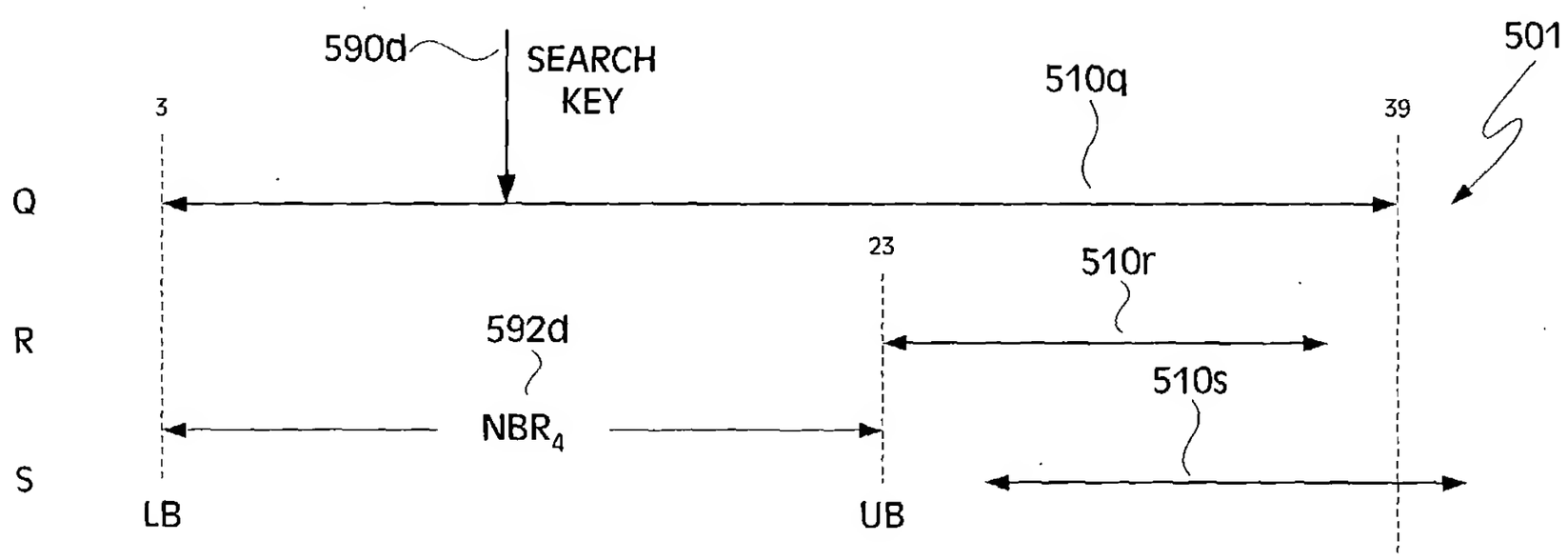

FIG. 8B

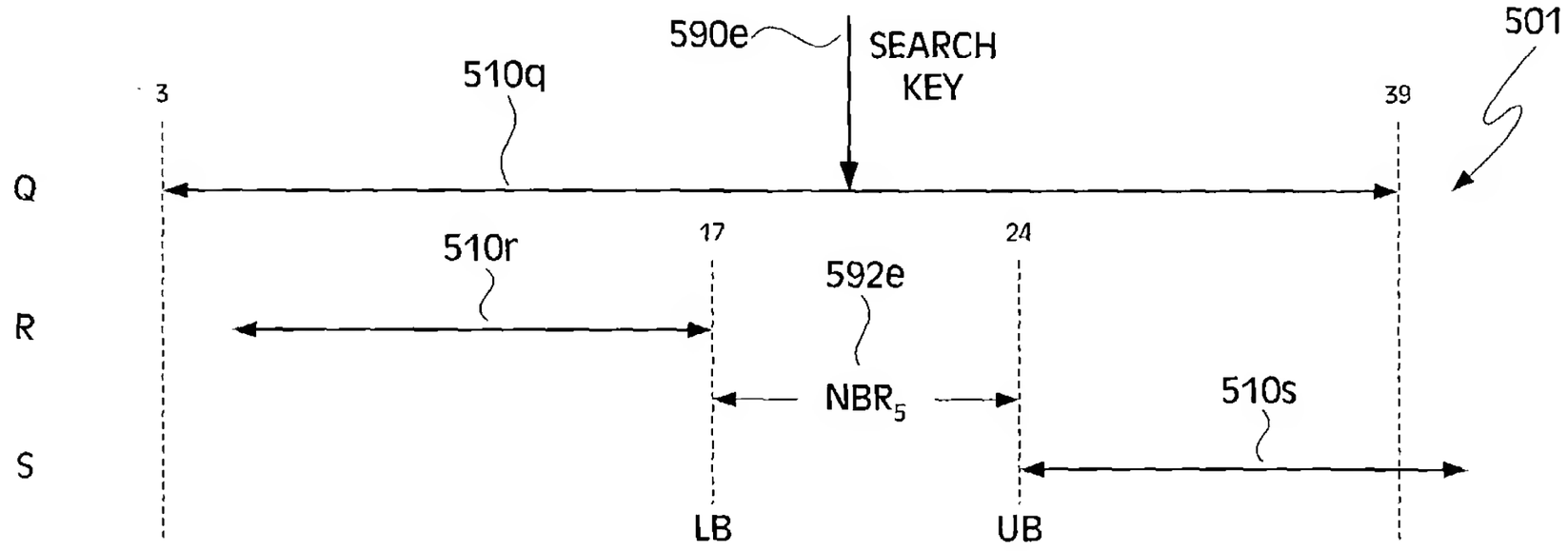

FIG. 8C

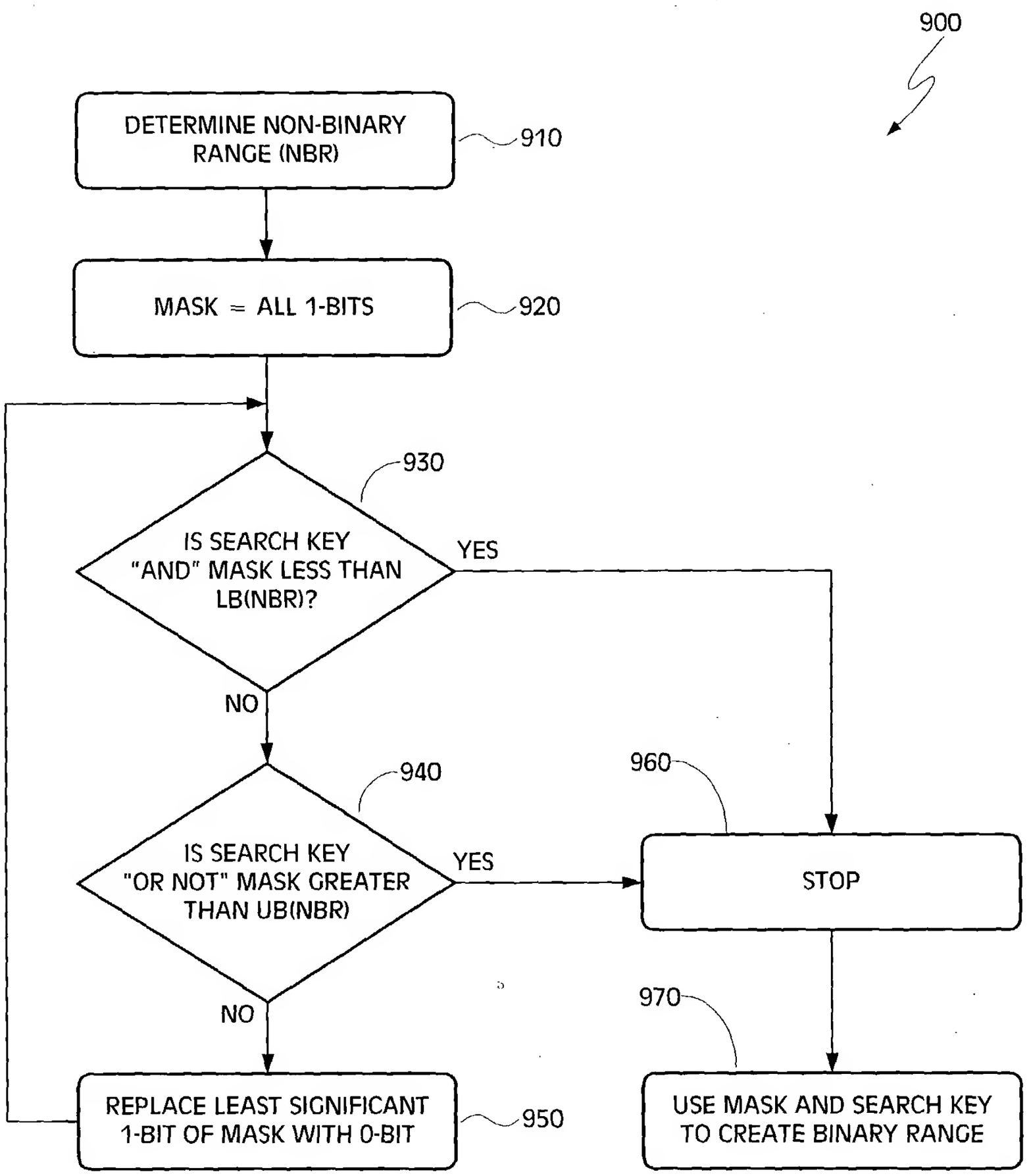
900
DETERMINE NON-BINARY RANGE (NBR)
910
MASK = ALL 1-BITS
920
930
IS SEARCH KEY "AND" MASK LESS THAN LB(NBR)?
YES
NO
940
IS SEARCH KEY "OR NOT" MASK GREATER THAN UB(NBR)
YES
NO
960
STOP
970
USE MASK AND SEARCH KEY TO CREATE BINARY RANGE
REPLACE LEAST SIGNIFICANT 1-BIT OF MASK WITH 0-BIT
950

FIG. 9